AD A109215

DELAWARE RIVER BASIN
RED SHALE BROOK, WAYNE COUNTY

PENNSYLVANIA

LAKE FLORENCE DAM

NDI I.D. NO. PA-01092
PENNDER I.D. NO. 64-207

LEVEL II

C. B. TREAT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DACW31-81-C-0015

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PREPARED BY

GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146

SEPTEMBER 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Lake Florence Dam: NDI I.D. No. PA-01092

Owner:	C. B. Treat
State Located:	Pennsylvania (PennDER I.D. No. 64-207)
County Located:	Wayne
Stream:	Red Shale Brook
Inspection Date:	20 May 1981
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and hydrologic/hydraulic analysis, the dam is considered to be in fair condition.

The size classification of the facility is small and the hazard classification is considered to be significant. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 100-year frequency flood and the 1/2 PMF (Probable Maximum Flood). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 100-year frequency flood. Results of the hydrologic and hydraulic analysis indicate the facility is not capable of passing the inflow resulting from a 100-year frequency flood without overtopping the embankment. Consequently, the spillway system at Lake Florence Dam is considered to be inadequate.

It is recommended that the owner immediately:

a. Develop a formal emergency warning system to minimize the potential for loss of life and economic damage downstream of the facility in the event of a dam failure. The system should include provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

b. Retain the services of a registered professional engineer experienced in the hydrology and hydraulics of dams to make recommendations for remedial measures to provide adequate spillway capacity.

c. Provide a means or develop a plan for draining the reservoir in the event that emergency conditions develop at the dam.

Lake Florence Dam: NDI I.D. No. PA-01092

d. Remove all trees, debris and excess vegetation from the downstream embankment face and beyond the downstream embankment toe for a distance of about 100 feet.

e. Clear excess vegetation from the discharge channels of both the left and right spillways and provide adequate erosion protection along the channel sidewalls.

f. Provide additional rock riprap where necessary along the upstream embankment face to protect against further erosion.

g. Continue to observe, in all future inspections, the ponding and swampy conditions along the downstream embankment toe, noting the development of any measurable seepage or changes in the general overall condition of the area.

h. Develop formal manuals of operation and maintenance to ensure the proper future care of the facility.

GAI Consultants, Inc.

Bernard M. Mihalcin, P.E.

Date 10 Sept 1981

Approved by:

James W. Peck
Colonel, Corps of Engineers
Commander and District Engineer

Date 18 Sep 1981

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
BERNARD M. MIHALCIN
ENGINEER
20371-E

OVERVIEW PHOTOGRAPH

TABLE OF CONTENTS

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LAKE FLORENCE DAM
NDI NO. PA-01092, PENNDER NO. 64-207

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Lake Florence Dam is a 21-foot high earth embankment approximately 268 feet long, including spillways. The facility is constructed with a small, uncontrolled, rectangular shaped, concrete spillway at each abutment. The total combined crest length of the two spillways is only 24 feet. The facility was constructed without any means for drawing down the reservoir.

b. Location. Lake Florence Dam is located on Red Shale Brook in Paupack Township, Wayne County, Pennsylvania. The facility is situated off Pennsylvania Route 590, less than three miles southwest of Hawley, Pennsylvania, and immediately downstream of Unger Lake. The dam, reservoir and watershed are contained within the Hawley, Pennsylvania, 7.5 minute U.S.G.S. topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N 41°28.1' and W 75°13.9'.

c. Size Classification. Small (21 feet high, 70 acre-feet storage capacity at top of dam).

d. Hazard Classification. Significant (see Section 3.1.e).

e. Ownership. C. B. Treat
Lakeville, Pennsylvania 18438

f. Purpose. Recreation.

g. Historical Data. Information obtained during the inspection interview revealed that Lake Florence Dam was originally constructed in 1947-48 by the present owner, Charles B. Treat. The facility was completed several months after the completion of the upstream Unger Dam. Apparently, Lake Florence Dam was never formally designed. In 1954, heavy rains resulted in the overtopping and failure of Unger Dam and, subsequently, the failure of Lake Florence Dam. Reportedly, no loss of life or significant downstream damage was incurred as a result of those events. The facility was reconstructed shortly thereafter and provided with additional spillway capacity.

No information is available from PennDER relative to the history of this facility.

1.3 Pertinent Data.

a. Drainage Area (square miles). 0.52

b. Discharge at Dam Site.

Discharge Capacity of Outlet Conduit - No outlet.

Discharge Capacity of Spillway at Maximum Pool ≅ 97 cfs (see Appendix D, Sheet 6).

c. Elevations (feet above mean sea level). The following elevations were obtained from field measurements based on the elevation of normal pool at the upstream Unger Dam at 1292.0 feet, as indicated on the U.S.G.S. 7.5 minute topographic quadrangle Hawley, Pennsylvania (see Appendix D, Sheet 1 and Appendix E, Figure 1).

Top of Dam	1285.4 (field).
Maximum Design Pool	Not known.
Maximum Pool of Record	Not known.
Normal Pool	1284.0 (field).
Left Spillway Crest	1284.0 (field; top of flashboard).
Right Spillway Crest	1284.0 (field; top of flashboard).
Upstream Inlet Invert	N/A.
Downstream Inlet Invert	N/A.
Downstream Embankment Toe	1264.5
Streambed at Dam Centerline	Not known.

d. Reservoir Length (feet).

Top of Dam	1100
Normal Pool	1100

e. Storage (acre-feet).

Top of Dam	70
Normal Pool	57

f. Reservoir Surface (acres).

Top of Dam	10
Normal Pool	9

g. Dam.

Type	Earth.
Length	244 feet (excluding spillways).
Height	21 feet (field measured; embankment crest to downstream embankment toe).
Top Width	13 feet.
Upstream Slope	2H:1V
Downstream Slope	1.5H:1V
Zoning	Not known
Impervious Core	Not known.
Cutoff	Not known.
Grout Curtain	Not known.

h. Diversion Canal and Regulating Tunnels. None.

i. Right Spillway.

Type	Uncontrolled, rectangular shaped, concrete channel located at the right abutment. No regulating weir.
Crest Elevation	1284.0 feet (field; top of flashboard).
Crest Length	16 feet (total). 15 feet (effective).

j. Left Spillway.

Type	Uncontrolled, rectangular shaped, concrete channel located at the left abutment. No regulating weir.
Crest Elevation	1284.0 feet (field; top of flashboard).
Crest Length	8 feet.

k. Outlet Conduit. None.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources. No design reports, calculations, miscellaneous design data, correspondence, state inspection reports, design or construction drawings are available from either the owner or PennDER.

b. Design Features.

1. Embankment. Based strictly on visual observations and field measurements, general statements can be made regarding the embankment design. The dam is a 21-foot high, 268-foot long earth embankment, including spillways. Apparently, the structure was never formally designed. It has a 13-foot wide crest which is covered with crushed stone and used as an access road. The upstream and downstream embankment slopes are set at 2H:1V and 1.5H:1V, respectively. A partial layer of sandstone riprap is provided along the upstream embankment face while the downstream embankment face is randomly strewn with large boulders. No information is available relative to the internal or foundation design of this structure.

2. Appurtenant Structures.

a. Spillways. The spillways, located adjacent the left and right abutments, are uncontrolled, rectangular shaped, concrete channels with no regulating weirs. The right spillway has an effective crest length of 15 feet whereas the left spillway crest length is 8 feet. Both spillways are spanned by wood plank bridges and were equipped, on the day of the inspection, with small wooden flashboards located at their channel entrances.

b. Outlet Conduit. The facility was constructed without an outlet conduit or effective means for drawing down the reservoir.

2.2 Construction Records.

No formal records or detailed information are available relative to the construction of the facility.

2.3 Operational Records.

No records of the day-to-day operation of the facility are available.

2.4 Other Investigations.

There are no available records concerning formal studies or investigations of Lake Florence Dam.

2.5 Evaluation.

There is no formal information available relative to the design and construction of this facility. The structure, based solely on external appearances, generally conforms in dimension to the standards established through modern engineering practice, with the possible exception of the steep downstream embankment slope set at 1.5H:1V. Although the structure appears presently stable, without specific knowledge of the properties of the materials utilized or construction techniques applied, any assessment of the integrity of the structure, particularly at high pools or during overtopping, is highly speculative.

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General The general appearance of the facility suggests the dam and its appurtenances are in fair condition.

b. Embankment. Observations made during the visual inspection indicate the embankment is in fair condition. The downstream embankment face is heavily overgrown with trees (6 to 18 inches in diameter) and brush and cannot be viewed in its entirety from a single vantage point (see Photographs 1, 2, 5 and 6). Various debris is scattered along the entire downstream embankment face, much of it within 50 feet of the left spillway (see Photographs 6 and 8). Minor erosion is evident along portions of the upstream embankment face that lack adequate riprap protection (see Photograph 3). Erosion is also evident along the downstream embankment toe adjacent to each spillway channel (see Photographs 10 and 12). No evidence of seepage through the downstream embankment face was observed; however, the general area downstream of the toe is swampy. Two standing water ponds were observed in this area. The larger pond, nearer the right abutment, is apparently fed by discharge from the right spillway and may or may not contain any seepage (see Photograph 7). The smaller pond, nearer the left abutment, is more likely to represent accumulated seepage; however, neither pond is considered significant at present.

c. Appurtenant Structures.

1. Right Spillway. The right spillway was reconstructed in 1977 and is presently in good condition. No evidence of significant concrete deterioration was observed (see Photograph 9). The discharge channel beyond the concrete section is cluttered and overgrown. Rock is strewn throughout the channel; however, the sidewalls are inadequately protected as evidenced by erosion. Erosion observed along the left sidewall is of special concern as that portion of the left sidewall abuts the downstream embankment toe (see Photograph 10).

2. Left Spillway. The left spillway is presently in good condition. No evidence of significant concrete deterioration was observed. The concrete section of the channel is cluttered with small debris (see Photograph 11). As with the right spillway, the discharge channel beyond the concrete section is overgrown and eroded (see Photograph 12).

d. Reservoir Area. The general area surrounding the reservoir is comprised of steep and heavily forested slopes. Several summer cabins are located around the perimeter of the reservoir; however, the watershed is characterized as primarily undeveloped. No signs of slope distress were observed.

Contained within the Lake Florence Dam watershed and located immediately upstream is Unger Dam (Phase I Inspection Report, National Dam Inspection Program, NDI I.D. No. PA-01090, prepared by GAI Consultants, Inc., dated September 1981). Unger Dam is a nine foot high earth embankment about 260 feet long, including spillway. The spillway is an uncontrolled, rectangular shaped, concrete and masonry chute channel with an approximate maximum discharge capacity of 80 cfs.

e. Downstream Channel. Discharges from Lake Florence Dam flow through a narrow, steep and heavily forested valley that is presently uninhabited. A small water supply reservoir servicing the community of Hawley, Pennsylvania, is located about 6,000 feet downstream of the dam. Approximately 8,300 feet below the dam, there stands the remnants of a small ski lodge and resort which was apparently destroyed by fire within the last several years. Due to the presence of the downstream water supply reservoir, the possibility exists for appreciable economic loss due to embankment failure. As a result, the hazard classification for Lake Florence Dam is considered to be significant.

3.2 Evaluation.

The overall appearance of the facility suggests it to be in fair condition. Remedial measures are necessary to; 1) remove debris and overgrowth from the downstream embankment face and spillway discharge channels; and 2) provide additional rock erosion protection along the sidewalls of the spillway discharge channels and upstream embankment face.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

Lake Florence Dam is essentially a self-regulating facility. That is, excess inflows are automatically discharged through the uncontrolled spillways. The facility has no outlet conduit or operable mechanisms associated with it. No formal operations manual is available.

4.2 Maintenance of Dam.

The condition of the facility, as observed by the inspection team, is indicative of a general lack of adequate maintenance. Reportedly, maintenance is currently performed by the owner on an unscheduled basis. No formal maintenance manual is available.

4.3 Maintenance of Operating Facilities.

No operable mechanisms are associated with this facility.

4.4 Warning System.

No formal warning system is presently in effect.

4.5 Evaluation.

The general appearance of the facility suggests a general lack of adequate maintenance. No formal operations or maintenance manuals are available for the facility, but, are recommended to ensure proper future care of the facility. Included in these manuals should be a formal plan to effect drawdown along with a formal emergency warning system that provides for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No formal design reports, calculations, or miscellaneous design data are available for the facility.

5.2 Experience Data.

Records of reservoir levels and/or spillway system discharges are not available.

5.3 Visual Observations.

On the date of the inspection, no conditions were observed that would indicate the spillway system could not function satisfactorily during a flood event, within the limits of its design capacity.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Lake Florence Dam ranges between the 100-year frequency flood and the 1/2 PMF (Probable Maximum Flood). This classification is based on the relative size of the dam (small), and the potential hazard of dam failure to downstream developments (significant). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 100-year frequency flood.

b. Results of Analysis. Lake Florence Dam was evaluated in order to determine if it could accommodate the 100-year frequency flood without overtopping of its embankment. The 100-year flood peak inflow was determined according to methods provided in the Pennsylvania Department of Environmental Resources, Water Resources Bulletin No. 13, "Floods in Pennsylvania" (see Appendix D, Sheet 3).

The peak inflow under this 100-year event was determined to be about 350 cfs, while the total maximum spillway capacity was found to be approximately 97 cfs. Therefore, it can be concluded that the embankment would be overtopped under the 100-year flood event, based on the assumption of little or no attenuation of the peak flow into the reservoir (Note: no hydrograph routing was performed in this analysis; see Appendix D, Sheets 8 and 9).

5.6 Spillway Adequacy.

As presented previously, Lake Florence Dam cannot accommodate the 100-year frequency flood (the SDF) without overtopping of its embankment. However, since its hazard category is considered to be significant, no breaching analysis was performed, in accordance with Corps directive ETL-1110-2-234. Thus, as Lake Florence Dam cannot accommodate its SDF, its spillway is considered to be inadequate.

SECTION 6

EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. The structural condition of the embankment is considered fair. The downstream embankment slope at 1.5H:1V is unusually steep for this type of construction, but nevertheless, appears stable in its present condition. The other deficiencies encountered can essentially be attributed to a lack of understanding of the proper needs and means for maintaining an earth embankment. The overgrowth observed along the downstream embankment face is considered to be a significant deficiency requiring immediate remedial attention. The root systems of large trees may offer a course for possible piping through the embankment. Furthermore, the existence of trees on the slope which may uproot and topple is a potential threat to the overall stability of the slope. Excess vegetation and debris obscure clear view of the downstream face, which may become critical in the event of an embankment emergency. The minor erosion observed along the upstream embankment face results from inadequate riprap protection, but, is not considered significant at present. The ponding and swampy conditions observed immediately beyond the downstream embankment toe are also not considered significant at this time; however, they should continue to be observed and noted in all future inspections.

b. Appurtenant Structures.

1. Right Spillway. The structural condition of the right spillway is considered good. No deficiencies were noted concerning the concrete portion of the channel. Erosion noted along the discharge channel is considered significant in the area where the left channel sidewall abuts the downstream embankment toe. Continued erosion, over an extended period, could result in embankment instability and eventual failure of the structure.

2. Left Spillway. The structural condition of the left spillway is considered good. The condition of the left spillway is similar to that of the right spillway; however, erosion noted along the channel sidewalls of the left spillway is of less concern, as the sidewalls do not directly abut the downstream embankment toe. Continued deterioration, nevertheless, could eventually encroach upon the toe. Consequently, the channel should be adequately protected.

3. Outlet Conduit. The facility currently has no operable means or plan for draining the reservoir. The ability to lower the reservoir and reduce the hydraulic head behind the embankment can significantly reduce the risk of sudden embankment failure due to seepage and/or piping.

6.2 Design and Construction Techniques.

No information is available that details the methods of design and/or construction of the facility.

6.3 Past Performance.

No records relative to the performance history of the facility are available. Information obtained during the inspection interview revealed that the present facility was constructed subsequent to the overtopping and breaching of the original structure in 1954. The present facility, reportedly, has never been overtopped.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. Although the downstream slope is unusually steep at 1.5H:1V, the embankment appears sufficiently stable in its present configuration. Thus, it is believed that the facility, as constructed, can withstand the expected dynamic forces; however, no calculations and/or investigations were performed to confirm this opinion.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The results of this investigation indicate the facility is in fair condition.

The size classification of the facility is small and the hazard classification is considered to be significant. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 100-year frequency flood and the 1/2 PMF (Probable Maximum Flood). Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 100-year frequency flood. Results of the hydrologic and hydraulic analysis indicate the facility is not capable of passing the inflow resulting from a 100-year frequency flood without overtopping the embankment. Consequently, the spillway system at Lake Florence Dam is considered to be inadequate.

b. Adequacy of Information. The available data are considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The recommendations listed below should be implemented immediately.

d. Necessity for Additional Investigations. No additional investigations are deemed necessary at this time.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner immediately:

a. Develop a formal emergency warning system to minimize the potential for loss of life and economic damage downstream of the facility in the event of a dam failure. The system should include provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

b. Retain the services of a registered professional engineer experienced in the hydrology and hydraulics of dams to make recommendations for remedial measures to provide adequate spillway capacity.

c. Provide a means or develop a plan for draining the reservoir in the event that emergency conditions develop at the dam.

d. Remove all trees, debris and excess vegetation from the downstream embankment face and beyond the downstream embankment toe for a distance of about 100 feet.

e. Clear excess vegetation from the discharge channels of both the left and right spillways and provide adequate erosion protection along the channel sidewalls.

f. Provide additional rock riprap where necessary along the upstream embankment face to protect against further erosion.

g. Continue to observe, in all future inspections, the ponding and swampy conditions along the downstream embankment toe, noting the development of any measurable seepage or changes in the general overall condition of the area.

h. Develop formal manuals of operation and maintenance to ensure the proper future care of the facility.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Lake Florence Dam STATE Pennsylvania COUNTY Wayne

NDI # PA — 01092 PENNDER # 64-207

TYPE OF DAM Earth SIZE Small HAZARD CATEGORY Significant

DATE(S) INSPECTION 20 May 1981 WEATHER Sunny TEMPERATURE 65° @ 11:00 a.m.

POOL ELEVATION AT TIME OF INSPECTION 1284.1 feet M.S.L.

TAILWATER AT TIME OF INSPECTION N/A. M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	OTHERS
B. M. Mihalcin	None.	
D. J. Spaeder		
D. L. Bonk		

RECORDED BY D. L. Bonk

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 01092
SURFACE CRACKS	None observed.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion evident along the upstream embankment face, the result of wave action. Erosion is also evident along the sidewalls of both spillway discharge channels. Erosion along the inside wall of the right spillway discharge channel is encroaching on the downstream embankment toe.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical - see "Profile of Dam Crest from Field Survey", Appendix A. Horizontal - Slightly curved toward lake.
RIPRAP FAILURES	Some sandstone type riprap is evident along the upstream embankment face; however, it does not cover the entire upstream face along the flow line. Consequently, some minor erosion has resulted.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition.

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA. 01092
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	Two ponded areas evident immediately beyond the downstream embankment toe. Pond nearest the right spillway is apparently fed by the spillway. Pond nearest left spillway is smaller and appears stagnant. May be seepage fed.
ANY NOTICEABLE SEEPAGE	None observed.
STAFF GAGE AND RECORDER	None.
DRAINS	None observed.

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 01092
INTAKE STRUCTURE	No outlet conduit.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	N/A.
OUTLET STRUCTURE	N/A.
OUTLET CHANNEL	N/A.
GATE(S) AND OPERATIONAL EQUIPMENT	N/A.

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 01092
TYPE AND CONDITION	Uncontrolled, rectangular shaped, concrete chute channel spillways located at the left and right abutments. Fair condition.
APPROACH CHANNEL	Both spillways have rock lined forebays, but, no defined approach channels.
SPILLWAY CHANNEL AND SIDEWALLS	Concrete sidewalls and channel floors at the control sections. Partially rocklined, trapezoidal shaped downstream channels.
STILLING BASIN PLUNGE POOL	N/A.
DISCHARGE CHANNEL	Erosion along left sidewall of right spillway is encroaching on the downstream embankment toe.
BRIDGE AND PIERS EMERGENCY GATES	Wooden bridges span both spillways, utilizing the spillways sidewalls for support.

SERVICE SPILLWAY

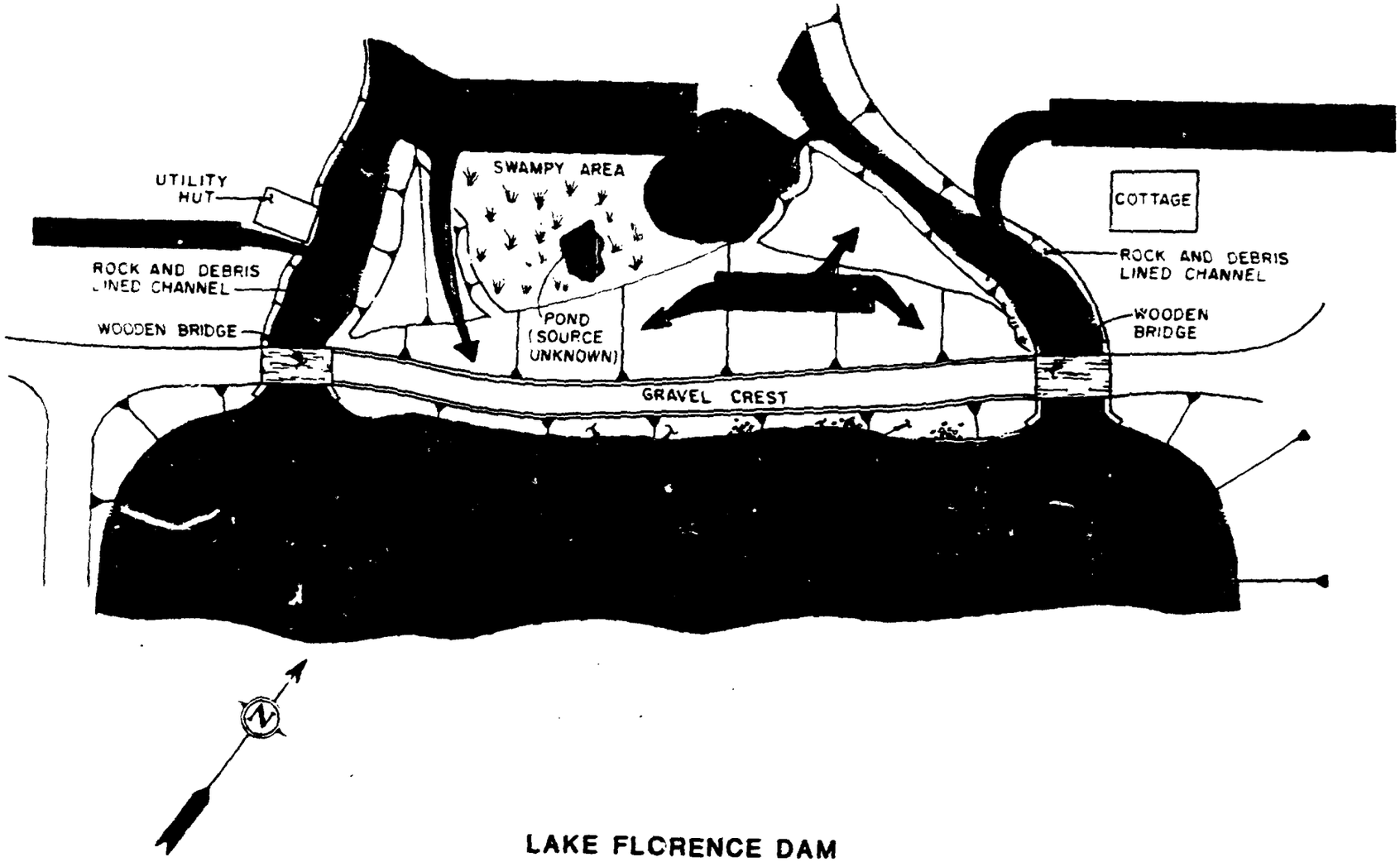
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 01092
TYPE AND CONDITION	N/A.
APPROACH CHANNEL	N/A.
OUTLET STRUCTURE	N/A.
DISCHARGE CHANNEL	N/A.

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 01092
MONUMENTATION SURVEYS	None.
OBSERVATION WELLS	None.
WEIRS	None.
PIEZOMETERS	None.
OTHERS	

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 01092
SLOPES: RESERVOIR	Steep and heavily forested.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	See below.
SLOPES: CHANNEL VALLEY	Narrow, steep and heavily forested valley that gradually broadens as Red Shale Brook approaches its confluence with Middle Creek about 9,000 feet downstream of Lake Florence.
APPROXIMATE NUMBER OF HOMES AND POPULATION	The valley between Lake Florence Dam and Middle Creek is presently uninhabited. A small water supply reservoir for the community of Hawley, Pennsylvania, is located about 6,000 feet downstream. A small ski resort occupied a portion of the valley several years ago, but, has since been destroyed by fire.



LAKE FLORENCE DAM

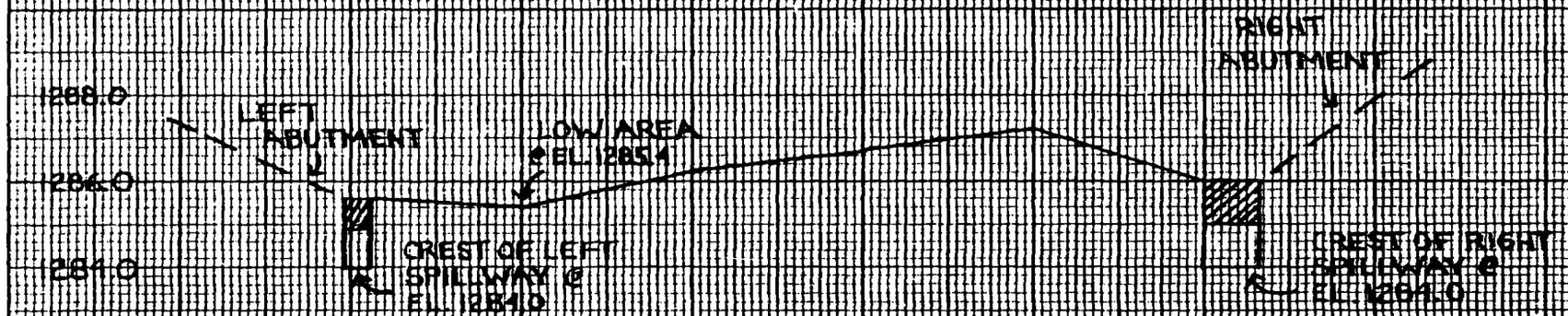
GENERAL PLAN - FIELD INSPECTION NOTES

K·E 20 X 20 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

NDI # PA-01092

LAKE FLORENCE DAM

PROFILE OF EMBANKMENT CREST
FROM FIELD SURVEY



SCALE:
VERTICAL: 1 IN = 4 FT
HORIZONTAL: 1 IN = 50 FT

SUBJECT	LAKE FLORENCE DAM		
BY	JJS	DATE 6-24-81	SHEET NO. ___ OF ___
CHKD. BY	DLH	DATE 7-27-81	PROJECT NO. 80-238-002

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
PHASE I

NAME OF DAM Lake Florence Dam

ITEM	REMARKS NDI# PA - 01092
PERSONS INTERVIEWED AND TITLE	Robert Treat - son of the owner, Charles B. Treat.
REGIONAL VICINITY MAP	See Figure 1, Appendix E.
CONSTRUCTION HISTORY	Originally constructed around 1947-48. Re-built in 1954 after heavy rains caused upstream Unger Dam to overtop and breach resulting in its own subsequent overtopping and failure. Right spillway reconstructed in 1977.
AVAILABLE DRAWINGS	None available.
TYPICAL DAM SECTIONS	None.
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	None.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 01092
SPILLWAY: PLAN SECTION DETAILS	None.	
OPERATING EQUIP- MENT PLANS AND DETAILS	No operable mechanisms.	
DESIGN REPORTS	None.	
GEOLOGY REPORTS	None.	
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None.	
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	None.	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 01092
BORROW SOURCES	Outside of reservoir area.	
POST CONSTRUCTION DAM SURVEYS	None.	
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.	
HIGH POOL RECORDS	Not known.	
MONITORING SYSTEMS	None.	
MODIFICATIONS	Re-built embankment in 1954. Re-built and enlarged right spillway in 1977.	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 01092
PRIOR ACCIDENTS OR FAILURES	Dam breached in 1954. No damage or personal injuries reported.	
MAINTENANCE: RECORDS MANUAL	No records or formal manual available.	
OPERATION: RECORDS MANUAL	No records or formal manual available.	
OPERATIONAL PROCEDURES	Self-regulating.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None.	
MISCELLANEOUS		

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-01092
PENNDER ID # 64-207

SIZE OF DRAINAGE AREA: 0.52 square mile.

ELEVATION TOP NORMAL POOL: 1284.0 STORAGE CAPACITY: 57 acre-feet.

ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -

ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -

ELEVATION TOP DAM: 1285.4 STORAGE CAPACITY: 70 acre-feet.

SPILLWAY DATA

CREST ELEVATION: 1284.0 feet (same for both spillways).

TYPE: Uncontrolled, rectangular shaped, concrete channels.

CREST LENGTH: 15 feet (right spillway); 8 feet (left spillway).

CHANNEL LENGTH:

SPILLOVER LOCATION: One at each abutment.

NUMBER AND TYPE OF GATES: Uncontrolled.

OUTLET WORKS

TYPE: None.

LOCATION: -

ENTRANCE INVERTS: -

EXIT INVERTS: -

EMERGENCY DRAWDOWN FACILITIES: None.

HYDROMETEOROLOGICAL GAGES

TYPE: None.

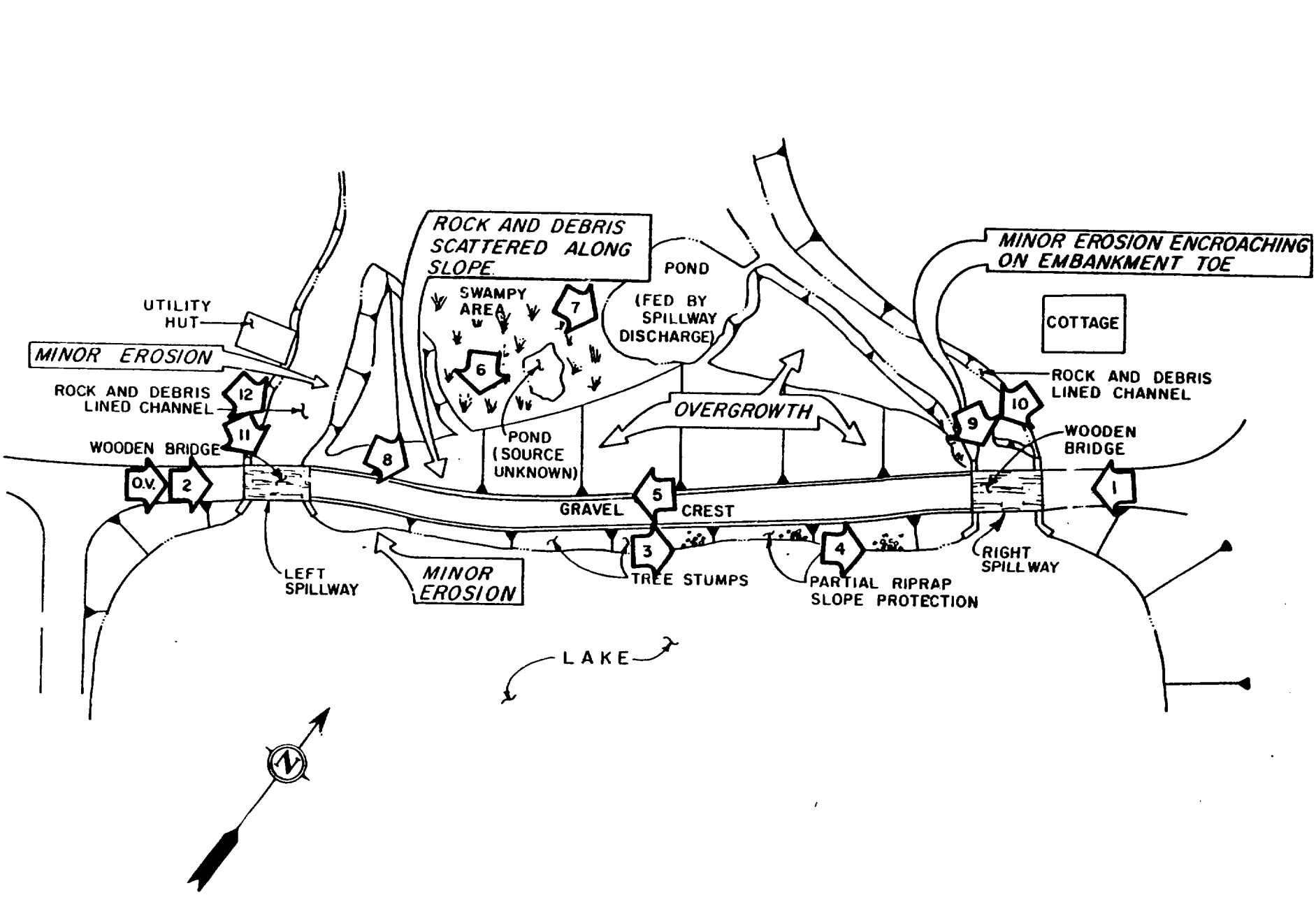
LOCATION: -

RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX C

PHOTOGRAPHS



LAKE FLORENCE DAM
PHOTOGRAPH KEY MAP

PHOTOGRAPH 1 — View of the embankment as seen from the right abutment.

PHOTOGRAPH 2 — View of the embankment as seen from the left abutment.

PHOTOGRAPH 3 — View of an unprotected, irregular, eroded portion of the upstream embankment face.

PHOTOGRAPH 4 — View of a portion of the upstream embankment face protected with riprap.

1

2

3

4

PHOTOGRAPH 5

View of the overgrown downstream embankment face as seen from the embankment crest.

PHOTOGRAPH 6

View of the debris cluttered downstream embankment face.

PHOTOGRAPH 7

View of the larger of two ponded areas along the downstream embankment toe.

PHOTOGRAPH 8

Close-up view of the debris cluttered downstream embankment face near the left abutment.

5

6

7

8

PHOTOGRAPH 9 — View, looking upstream, of the spillway at the right abutment.

PHOTOGRAPH 10 — View of an area of erosion along the right spillway discharge channel adjacent the downstream embankment toe.

PHOTOGRAPH 11 — View, looking upstream, of the spillway at the left abutment.

PHOTOGRAPH 12 — View of an area of minor erosion along the left spillway discharge channel.

9

10

11

12

APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSES

SUBJECT DAM SAFETY INSPECTION
FLORENCE LAKE DAM

BY DJS DATE 6-12-81 PROJ. NO. 80-238-092

CHKD. BY DLB DATE 6-24-81 SHEET NO. 1 OF 9

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DAM STATISTICS

HEIGHT OF DAM = 21 FEET (FIELD MEASURED - TOP OF DAM TO DOWNSTREAM EMBANKMENT TOE; "TOP OF DAM" NOTED AND ON ALL SUBSEQUENT CALCULATION SHEETS REFERS TO THE LOW AREA IN THE EMBANKMENT CREST).

NORMAL POOL STORAGE CAPACITY = 57 AC-FT (SHEET 3)

MAXIMUM POOL STORAGE CAPACITY = 70 AC-FT (SHEET 3)
(@ TOP OF DAM)

DRAINAGE AREA = 0.52 SQUARE MILES

(LOCAL D.A. = 0.15 SQ MI., UNGERS LAKE D.A. = 0.37 SQ. MI.)

- PLANIMETERED ON USGS TOPO QUAD - HAWLEY, PA.

ELEVATIONS:

TOP OF DAM (DESIGN)	= NOT KNOWN	
TOP OF DAM (FIELD)	= 1285.4	
NORMAL POOL	= 1284.0	(SEE NOTE 1)
CREST OF RIGHT SPILLWAY	= 1284.0	
CREST OF LEFT SPILLWAY	= 1284.0	
UPSTREAM INLET INVERT	= N/A	
DOWNSTREAM OUTLET INVERT	= N/A	
DOWNSTREAM EMBANKMENT TOE	= 1264.5	

NOTE 1: NORMAL POOL AT LAKE FLORENCE MEASURED TO BE ABOUT 8.3 FEET BELOW NORMAL POOL AT UNGERS LAKE (FIELD SURVEY), WHICH IS INDICATED AT 1292.0 ON USGS TOPO QUAD - HAWLEY, PA).

SUBJECT DAM SAFETY INSPECTION
FLORENCE LAKE DAM

BY DJS DATE 6-12-81 PROJ. NO. 80-238-092

CHKD. BY DLG DATE 6-24-81 SHEET NO. 2 OF 9

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DAM CLASSIFICATION

DAM SIZE: SMALL (REF 1, TABLE 1)

HAZARD CLASSIFICATION: SIGNIFICANT (FIELD OBSERVATION)

REQUIRED SDF: 100-YEAR FLOOD TO ½PMF (REF 1, TABLE 3)

SELECTED SDF = 100-YEAR FLOOD.

RESERVOIR CAPACITY

SURFACE AREA (S.A) @ NORMAL POOL (EL. 1284.0) = 9 ACRES.

S.A. @ EL. 1300.0 = 17 ACRES (SEE NOTE 2)

(PLANIMETERED ON USGS TOPO QUAD - HAWLEY, PA)

S.A. @ TOP OF DAM (EL 1285.4) = 9.7 ACRES

(BY LINEAR INTERPOLATION)

DETERMINE RESERVOIR STORAGE CAPACITY USING MODIFIED PRISMOIDAL RELATIONSHIP:

$$\Delta V_{1-2} = \frac{h}{3}\left(A_1 + A_2 + \sqrt{A_1 \cdot A_2}\right)$$ (REF 14, p. 15)

NOTE 2: SINCE IT WAS DETERMINED THAT THE NORMAL POOL LEVEL AT FLORENCE LAKE IS APPROXIMATELY AT EL. 1284 (SEE NOTE 1, SHEET 1), IT IS ASSUMED THAT THE CONTOUR LINE CORRESPONDING TO EL. 1280 (SHOWN TO BE ABOVE THE LEVEL OF THE LAKE) IS IN ERROR.

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WHERE

ΔV_{1-2} = INCREMENTAL VOLUME BETWEEN ELEVATIONS 1 & 2, IN AC-FT,
h = ELEVATION 1 - ELEVATION 2, IN FT,
A_1 = S.A. @ EL. 1, IN ACRES,
A_2 = S.A @ EL. 2, IN ACRES.

- ASSUMING THAT THE MINIMUM RESERVOIR ELEVATION = 1265 (WHICH IS APPROXIMATELY THE ELEVATION OF THE DOWNSTREAM TOE OF THE EMBANKMENT),

$$\text{STORAGE CAPACITY @ NORMAL POOL} = \left(\frac{19}{3}\right)(9)$$
$$= \underline{57.0} \text{ AC-FT}$$

STORAGE CAPACITY @ TOP OF DAM (EL. 1385.4) =

$$57.0 + \left(\frac{1.4}{3}\right)\left(9.0 + 9.7 + \sqrt{9.0 \times 9.7}\right)$$
$$= \underline{70.1} \text{ AC-FT}$$

100-YEAR FLOOD COMPUTATION

THE DETERMINATION OF THE 100-YEAR FREQUENCY FLOOD PEAK WAS BASED ON PENNDER WATER RESOURCES BULLETIN No. 13, "FLOODS IN PENNSYLVANIA," OCTOBER, 1977:

ON PLATE 1, BULLETIN No. 13, IT CAN BE SEEN THAT THE FLORENCE LAKE WATERSHED IS ESSENTIALLY ON THE BOUNDARY BETWEEN FLOOD FREQUENCY REGIONS 2 AND 3. HOWEVER, SINCE THE DAM ULTIMATELY DISCHARGES INTO MIDDLE CREEK, AND SINCE THE MIDDLE CREEK BASIN IS LOCATED IN REGION 2, THE FLORENCE LAKE WATERSHED IS CONSIDERED TO BE ENTIRELY WITHIN REGION 2.

SUBJECT DAM SAFETY INSPECTION
FLORENCE LAKE DAM

BY DJS DATE 6-15-81 PROJ. NO. 80-238-092

CHKD. BY DLB DATE 6-24-81 SHEET NO. 4 OF 9

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THE REGRESSION EQUATION FOR REGION 2 IS

$$Q_{100} = CA^X$$

WHERE Q_{100} = 100-YEAR FREQUENCY FLOOD PEAK FLOW, IN CFS,
A = DRAINAGE AREA, IN SQ. MI.,
C, X = REGRESSION COEFFICIENTS.

FROM TABLE 2, BULLETIN No. 13,

$C = 564$
$x = 0.744$

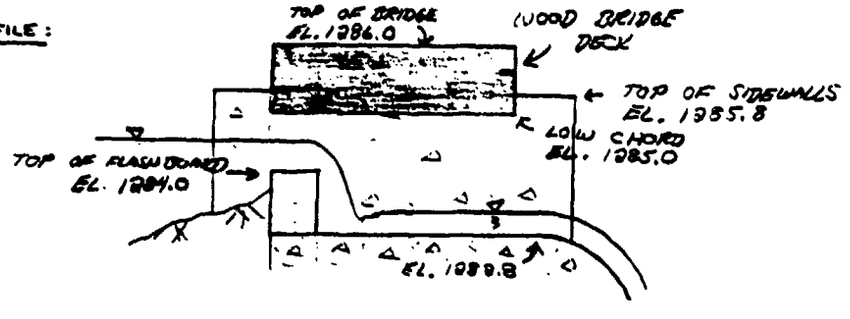
$$\therefore Q_{100} = 564\,(0.52)^{0.744} = 346 \text{ CFS} = \underline{350} \text{ CFS.}$$

THE REGRESSION EQUATION IS BASED ON RECORDS FOR 50 GAGING STATIONS IN REGION 2, WITH DRAINAGE AREAS OF 2.0 SQUARE MILES OR GREATER. IT IS ASSUMED THAT THE EQUATION MAY BE APPLIED TO THIS 0.52-SQUARE MILE BASIN.

SPILLWAY CAPACITY

I) RIGHT SPILLWAY:

PROFILE:



(NOT TO SCALE)

SUBJECT DAM SAFETY INSPECTION
FLORENCE LAKE DAM

BY DJS DATE 6-15-81 PROJ. NO. 80-238-092
CHKD. BY DLA DATE 6-24-81 SHEET NO. 5 OF 9

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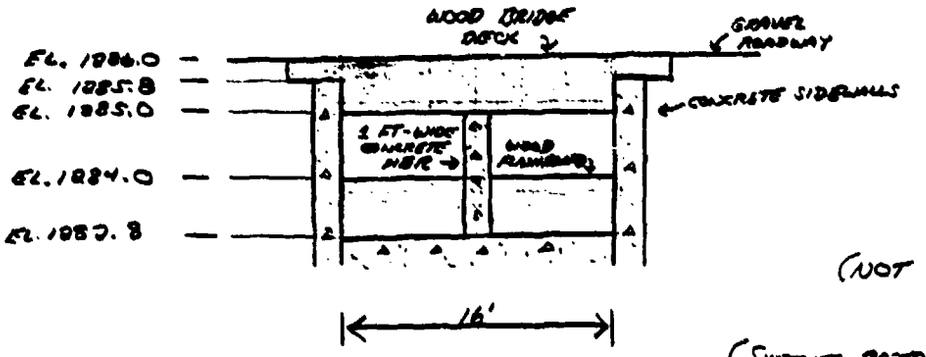
CROSS-SECTION: (LOOKING UPSTREAM)



(NOT TO SCALE)

(SKETCHES BASED ON FIELD MEASUREMENTS)

THE RIGHT SPILLWAY CONSISTS OF A RECTANGULAR-SHAPED CONCRETE CHANNEL WHICH DISCHARGES INTO A NATURAL STREAM, AND WITH DISCHARGES CONTROLLED BY A WOODEN PLANKBOARD STRUCTURE.

DETERMINE MAXIMUM SPILLWAY CAPACITY:

1) WEIR FLOW CONTROL:

ASSUME DISCHARGE CAN BE ESTIMATED BY THE RELATIONSHIP

$$Q = CLH^{3/2} \qquad \text{(REF 5, p. 5-23)}$$

WHERE Q = DISCHARGE, IN CFS,
C = COEFFICIENT OF DISCHARGE,
L = WEIR LENGTH, IN FT,
H = HEAD, IN FT.

IT IS ASSUMED THAT $C = 3.087$; THE DISCHARGE COEFFICIENT FOR CRITICAL FLOW IN A RECTANGULAR SECTION IS APPLICABLE HERE (REF. 5, p. 5-24). ALSO, THE EFFECTIVE WEIR LENGTH IS

$$16.0 - 1.0 = \underline{15.0 \text{ FT}}.$$

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∴ AT EL. 1285.4 (TOP OF DAM),

$$Q = (3.087)(15.0)(1.4)^{3/2} = \underline{77} \text{ CFS}$$

2) ORIFICE FLOW CONTROL:

ASSUME DISCHARGE UNDER THE DRUM CAN BE ESTIMATED BY THE EQUATIONS OF FLOW THROUGH BOX CULVERTS UNDER INLET CONTROL (SEE NOTE 3):

FOR $H/D > 1.2$, $Q = C_H B D \sqrt{2g(H - C_H D)}$

WHERE Q = FLOW THROUGH CULVERT, IN CFS,
B = EFFECTIVE WIDTH OF CULVERT = 15 FT,
D = HEIGHT OF CULVERT = 1 FT,
H = HEAD ON CULVERT, IN FT,
C_H = DISCHARGE COEFFICIENT = 0.6 (SQUARE-EDGE ENTRANCE),
g = GRAVITATIONAL ACCELERATION CONSTANT = 32.2 FT/SEC^2

∴ AT EL. 1285.4 (TOP OF DAM), $H/D = 1.4/1.0 = 1.4$,

$$Q = (0.6)(15)(1)\sqrt{(2)(32.2)[1.4 - (0.6)(1.0)]}$$
$$= \underline{65} \text{ CFS}$$

IN COMPARING THE RIGHT SPILLWAY CAPACITY UNDER WEIR CONTROL (77 CFS) AND ORIFICE CONTROL (65 CFS), IT IS SEEN THAT ORIFICE FLOW DICTATES. THEREFORE, THE MAXIMUM CAPACITY OF THE RIGHT SPILLWAY IS 65 CFS.

NOTE 3: FROM OPEN CHANNEL FLOW, F.M. HENDERSON, MACMILLAN PUBLISHING CO., INC., NEW YORK, 1966, p. 263.

SUBJECT DAM SAFETY INSPECTION
FLORENCE LAKE DAM

BY DJS DATE 6-15-81 PROJ. NO. 80-238-092

CHKD. BY DLB DATE 6-24-81 SHEET NO. 7 OF 9

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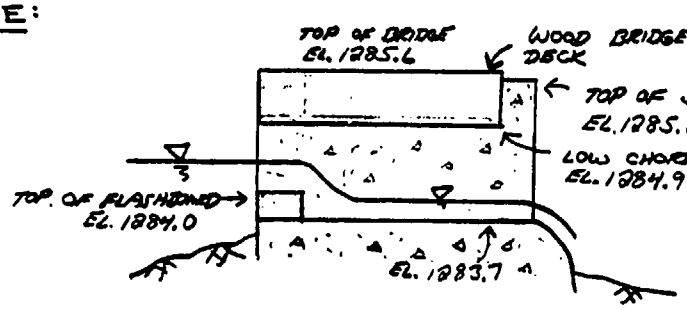
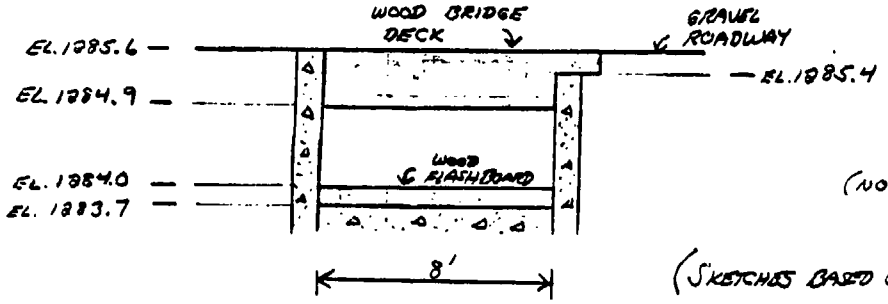
II) LEFT SPILLWAY:

PROFILE:



(NOT TO SCALE)

CROSS-SECTION: (LOOKING UPSTREAM)



(NOT TO SCALE)

(SKETCHES BASED ON FIELD MEASUREMENTS)

THE LEFT SPILLWAY CONSISTS OF A RECTANGULAR-SHAPED CONCRETE CHANNEL WHICH DISCHARGES INTO A NATURAL STREAM, AND WITH DISCHARGES CONTROLLED BY A WOODEN FLASHBOARD.

DETERMINE MAXIMUM SPILLWAY CAPACITY:

1) WEIR FLOW CONTROL:

ASSUME DISCHARGE CAN BE ESTIMATED BY THE RELATIONSHIP

$$Q = CLH^{3/2}$$ (SEE SHEET 5)

WHERE $C = 3.087$ (SEE SHEET 5)

AND $L = 8.0$ FT (FIELD MEASURED).

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∴ AT EL 1885.4 (TOP OF DAM),

$$Q = (3.087)(8.0)(1.4)^{3/2} = \underline{41} \text{ CFS}$$

2) ORIFICE FLOW CONTROL:

ASSUME DISCHARGE UNDER THE BRIDGE CAN BE ESTIMATED BY THE EQUATIONS OF FLOW THROUGH BOX CULVERTS UNDER INLET CONTROL (SEE SHEET 6):

$$Q = C_H B D \sqrt{2g(H - C_H D)} \qquad \text{(SHEET 6)}$$

∴ AT EL. 1885.4,

$$Q = (0.6)(8.0)(0.9)\sqrt{2(32.2)[1.4 - (0.6)(0.9)]}$$
$$= \underline{32} \text{ CFS}$$

IN COMPARING THE LEFT SPILLWAY CAPACITY UNDER WEIR CONTROL (41 CFS) AND ORIFICE CONTROL (32 CFS), IT IS SEEN THAT ORIFICE FLOW DICTATES. THEREFORE, THE MAXIMUM CAPACITY OF THE LEFT SPILLWAY IS 32 CFS.

TOTAL SPILLWAY CAPACITY AT TOP OF DAM:

$$\text{TOTAL MAXIMUM SPILLWAY CAPACITY} = Q_{\text{RIGHT SPILLWAY}} + Q_{\text{LEFT SPILLWAY}}$$
$$= 65 + 32$$
$$= \underline{97} \text{ CFS}$$

SUBJECT DAM SAFETY INSPECTION
FLORENCE LAKE DAM

BY DJS DATE 6-15-81 PROJ. NO. 80-238-092

CHKD. BY DLB DATE 6-24-81 SHEET NO. 9 OF 9

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IN COMPARING THE 100-YEAR FREQUENCY FLOOD PEAK (350 CFS) WITH THE TOTAL MAXIMUM SPILLWAY CAPACITY (97 CFS), IT IS SEEN THAT THE DAM WILL BE OVERTOPPED UNDER THE 100-YEAR EVENT. IT WAS ASSUMED HERE THAT THERE WOULD BE NO SIGNIFICANT ATTENUATION OF THE PEAK INFLOW, BOTH AT FLORENCE LAKE DAM AND THE UPSTREAM UNGER DAM. THEREFORE, THE SPILLWAY IS CONSIDERED TO BE INADEQUATE.

LIST OF REFERENCES

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2. "Unit Hydrograph Concepts and Calculations," by the U. S. Army, Corps of Engineers, Baltimore District (L-519).

3. "Seasonal Variation of Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24, and 48 Hours," Hydrometeorological Report No. 33, prepared by J. T. Reidel, J. F. Appleby and R. W. Schloemer, Hydrologic Service Division, Hydrometeorological Section, U. S. Army, Corps of Engineers, Washington, D. C., April 1956.

4. Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation, Washington, D. C., 1973.

5. Handbook of Hydraulics, H. W. King, and E. F. Brater, McGraw-Hill, Inc., New York, 1963.

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10. Flood Hydrograph Package (HEC- 1) Dam Safety Version, Hydrologic Engineering Center, U. S. Army, Corps of Engineers, Davis, California, July 1978.

11. "Simulation of Flow Through Broad Crest Navigation Dams with Radial Gates," R. W. Schmitt, U. S. Army, Corps of Engineers, Pittsburgh District.

12. "Hydraulics of Bridge Waterways," BPR, 1970, Discharge Coefficient Based on Criteria for Embankment Shaped Weirs, Figure 24, page 46.

13. Applied Hydraulics in Engineering, H. M. Morris and J. N. Wiggert, Virginia Polytechnic Institute and State University, 2nd Edition, The Ronald Press Company, New York, 1972.

14. Standard Mathematical Tables, 21st Edition, The Chemical Rubber Company, 1973, page 15.

15. Engineering Field Manual, U. S. Department of Agriculture, Soil Conservation Service, 2nd Edition, Washington, D. C., 1969.

16. Water Resources Engineering, R. K. Linsley and J. B. Franzini, McGraw-Hill, Inc., New York, 1972.

17. Engineering for Dams, Volume 2, W. P. Creager, J. D. Justin, J. Hinds, John Wiley & Sons, Inc., New York, 1964.

18. Roughness Characteristics of Natural Channels, H. H. Barnes, Jr., Geological Survey Water-Supply Paper 1849, Department of the Interior, United States Geological Survey, Arlington, Virginia, 1967.

19. "Hydraulic Charts for the Selection of Highway Culverts," Hydraulic Engineering Circular No. 5, Bureau of Public Roads, Washington, D. C., 1965.

APPENDIX E

FIGURES

LIST OF FIGURES

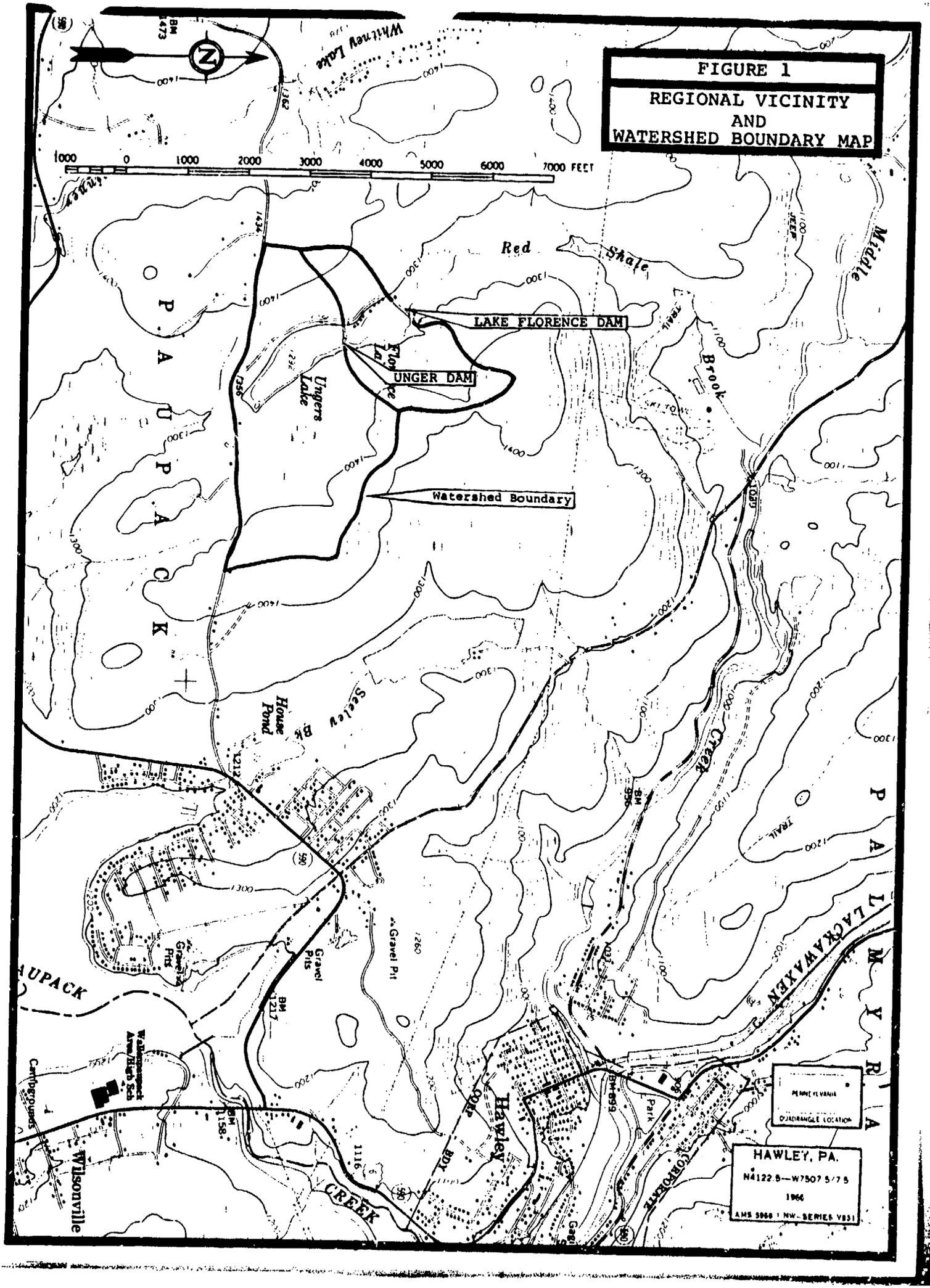
FIGURE 1
REGIONAL VICINITY
AND
WATERSHED BOUNDARY MAP
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
LAKE FLORENCE DAM
UNGER DAM
Watershed Boundary
Red Shale
Whitney Lake
Ungers Lake
House Pond
Selev Br
Gravel Pits
Gravel Pit
Wilsonville
Campgrounds
Hawley
Park
PENNSYLVANIA
QUADRANGLE LOCATION
HAWLEY, PA.
N4122.5—W7507.5/7.5
1966
AMS 5868 I NW—SERIES V831

APPENDIX F

GEOLOGY

Geology

Lake Florence Dam is located in the glaciated Low Plateaus section of the Appalachian Plateaus physiographic province of northeastern Pennsylvania. In this area, the Appalachian Plateaus province is characterized topographically by flat-topped, hummocky hills formed as a result of glaciation and subsequent stream dissection of nearly flat-lying strata. The Devonian age sedimentary rock strata in Wayne County regionally strike N35°E and dip gently to the northwest. The Delaware River is the major drainage basin in the area. Major tributary streams intersect the Delaware River at right angles; whereas, smaller streams display a slightly more random tributary pattern. Both major and minor tributary stream systems are joint controlled and exhibit modified rectangular and trellis-type drainage patterns.

Structurally, the area containing the dam site lies on the south flank of a broad, asymmetrical synclinorium that plunges to the southwest. Superimposed on this broad structural basin are numerous anticlinal and synclinal folds characterized by planar limbs and narrow hinges. Due to prior glaciation, low relief and surficial soil cover, fold axes are difficult to trace.

The sedimentary rock sequences in the vicinity of the dam and reservoir are probably of Upper Devonian age (see Geology Map). The sedimentological changes observed in the Catskill Formation *Upper Devonian Age) indicate that the rate of sedimentation exceeded the rate of basin subsidence resulting in a facies change from marine to non-marine strata.

Approximately half of Wayne County, including the dam site, is covered by a blanket of Wisconsin age (most recent) glacial drift which, based on the degree of weathering, was probably deposited during the Woodfordian stage. Valley bottoms are typically covered by recent alluvium and Woodfordian outwash of variable thickness, but typically less than 10 feet. These deposits are characteristically unconsolidated stratified sand and gravel, usually with more gravel than sand and some small boulders. The direction of the Wisconsin ice advance was from the northeast over the Catskill Mountains and from the north over the Appalachian Plateau. The terminal moraine resulting from the southern most advance of the Wisconsin ice sheet in this area is located in the southern portion of Monroe County which partially borders Wayne County to the South.

References:

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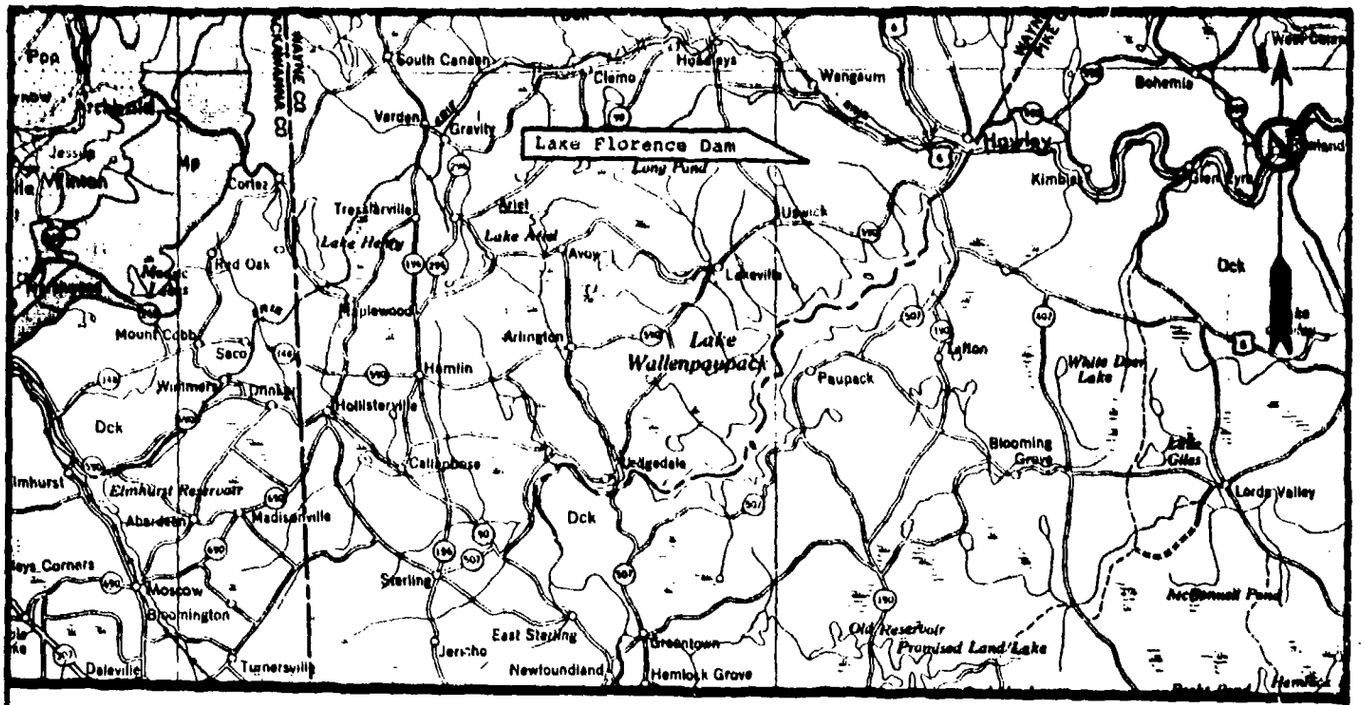
2. Sevon, W. D., Berg, T. M., "Geology and Mineral Resources of the Skytop Quadrangle, Monroe and Pike Counties, Pennsylvania", Pennsylvania Geological Survey, Fourth Series, Harrisburg, Atlas 214A., 1978.

3. Sevon, W., Personal Communication, Commonwealth of Pennsylvania Department of Environmental Resources, Harrisburg, December 3, 1980.



LEGEND

PENNSYLVANIAN

ANTHRACITE REGION

Ppp — **Post-Pottsville Formations**
Brown or gray sandstones and shales with some conglomerate and numerous unworkable coals.

Pp — **Pottsville Group**
Light gray to white, coarse grained sandstones and conglomerates with some unworkable coal; includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.

MISSISSIPPIAN

Mp — **Pocono Group**
Predominantly gray, hard, massive, crossbedded conglomerate and sandstone with some shale, includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Cussewago, Corry, and Knapp Formations, includes part of "Osaunee" of M.L. Fuller in Potter and Tioga counties

UPPER DEVONIAN

Dck — **Catskill Formation**
Chiefly red to brownish shales and sandstones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east.

Scale

0 2 4 6 8 10 MILES

REFERENCE:
GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA. DEPT. OF INTERNAL AFFAIRS, 1950, SCALE 1" = 4 MILES

GEOLOGY MAP

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